# DEER MEASURE COST DATA
# USERS GUIDE

## 1. Introduction

This document provides a guide to the DEER Measure Cost Data. Incremental and installed cost data are provided for the full range of residential and non-residential weather sensitive and non-weather sensitive measures contained in the 2005 DEER update. Measure Cost Data is available in three different forms. First, the data is available as part of the measure detail from the DEER website. These data are specific to each measure configuration on the website. Second, the data is available as a downloadable file under Supporting Documents from the website. These data contain more detail and measure variations than the pricing included in the measure detail. For example, the price of a 90% AFUE furnace in the measure detail represents the expected cost of a 100,000 Btu furnace while the downloadable file contains expected costs for various furnace sizes from 60,000 to 140,000 Btuh. Finally, the measure cost data is provided in hard copy as part of the project final report. The cost data is reported in 2005 dollars.

It is important to note that the costs provided are for *first costs only and do not include lifecycle or operations and maintenance (O&M) costs or cost savings.* Although analysts did encounter and uncover ongoing O&M or lifecycle costs as part of the research, systematic documentation of these costs was not a part of this study. Examples of measures where lifecycle or O&M costs may be an important factor in program planning and measure analysis include:

- Reduced lamp replacement costs with compact fluorescent lamps – CFLs have a lamp life that is 5 to 10 times longer than an incandescent lamp. Assuming a CFL lamp life of 10,000 hours compared to 2000 for long-life incandescent lamps and 5 incandescent replacements over the life of the CFL, the resulting lifecycle materials and labor cost savings are approximately 5 x ($0.61 + $3.77) = $21.90.
- Water treatment cost for water-cooled air conditioning systems – While water-cooled air conditioning systems are attractive because of their greater operating and peak load efficiencies, they do result in additional water use and water treatment costs compared to air cooled equipment. One vendor estimated water treatment costs for non-residential water-cooled systems at $20/ton/year.
- Reduced fluorescent lamp life with occupancy sensors – Some reports state that the useful life of compact fluorescent lamps and some fluorescent lamp-ballast combinations can be shortened due to more frequent switching causing increased replacement costs. For example, Osram Sylvania estimates that T8 lamp life can be reduced from 24,000 hours to 7000 hours when the switch cycle is reduced from 12 hours to 30 minutes.[1]

There are five elements to the measure cost data:

1. Measure equipment cost – the cost of the energy-efficient technology
2. Base equipment cost – the cost of the baseline efficiency technology
3. Incremental cost – the difference between the measure equipment cost and the base equipment cost
4. Labor cost – the installation cost of the measure including contractor overhead & profit

[1] Osram Sylvania, *Ballast-Lamp Technology Update FAQ*, 2000.

5. Installed cost – the sum of the measure equipment cost and the labor cost

How these five elements combine to form the cost for a measure is determined by the "application" and "cost basis" designators as discussed in Section 2. A measure cost may include all of these cost elements or only a subset depending on the application characteristics of the measure.

## 2. Application and Cost Basis

Application and cost basis designators are used to determine what kind of cost is reported. The two designators are linked and the application typically leads to the determination of the cost basis. Each of these designators is discussed below.

***Application***

The application designation is important because it helps to define the types of projects where a measure is expected to be applied and therefore helps define what type of cost estimate is needed. There are three application codes that have been used to identify how the measure is expected to be applied:

- **Retrofit (RET)** – replacing a working technology prior to failure
- **Replace-on-burnout (ROB)** – replacing a technology at the end of its useful life
- **New construction (NEW)** – installing a technology in a new construction or major renovation project

***Cost Basis***

The cost basis designator is used to define for each measure if the appropriate cost is the incremental or installed cost. The cost basis is determined by the application (RET, ROB or NEW), and whether it is displacing an existing technology, installed in the absence of an existing technology, or is an alternative to a competing technology.

The cost basis designation is used to define whether the cost is:

- **Incremental (INCR)** – the differential cost between a base technology and an energy-efficient technology

  Incremental cost (INCR) = Measure cost – base case cost

- **Installed (FULL)** – the full or installed cost of the measure including equipment, labor, overhead & profit (OH&P)

  Installed cost (FULL) = measure equipment cost + labor including OH&P

The application and cost basis are defined for each measure. As a general guide, a retrofit (RET) application typically means that the cost basis is the FULL or installed cost -- a customer is replacing a working system with a new technology or is installing a technology that was not there before thus bearing the full cost of the installation. Examples include replacing incandescent exit signs in existing buildings with LED, replacing incandescent lamps before the end of their useful life with CFLs, and installing ceiling insulation in a home that did not formerly have any insulation.

Replace-on-burnout (ROB) and new construction (NEW) applications typically have a cost basis of incremental cost (INCR) – a customer is choosing between a less and more efficient technology. Incremental cost usually means incremental equipment cost with no labor cost; that is, there is no labor cost or it is the same in both cases thus a zero sum. Examples include installing a higher SEER AC unit at the end of its useful life, installing a premium efficiency motor as opposed to a rewind at the time of burnout, and installing a higher efficiency chiller in a new construction application.

However, these are not hard and fast rules and there are exceptions. For example, occupancy sensors have been designated as retrofit and new construction applications, yet their cost bases are considered to

be FULL or installed in both cases since there is a cost to the installation beyond that of normal on/off switching in both applications. Similarly, installing a heat recovery system is considered to be a retrofit and new construction application, yet the cost basis is defined as FULL or installed in both cases because it is an addition or option to a conventional system. Therefore, each measure needs to be examined individually with respect to application and cost basis.

FULL or installed cost typically uses the measure equipment cost of the technology, not an incremental cost. In most cases, there is no "incremental cost". For example, occupancy sensors have a cost basis of FULL and use the cost of the sensor (measure equipment cost) plus the labor to install it. There is no incremental cost in this case because the baseline is the absence of a sensor or an existing conventional on/off switch that is being displaced.

## 3. Interpreting the Cost Data

When interpreting the cost data, there a several important points to consider including:

- **Discrete vs. representative prices.** Some of the measure cost values are discrete prices for a specific technology, while some of the cost values are representative prices for a range of product sizes and/or efficiencies. For example, incremental costs are provided for specific motor horsepowers for non-weather sensitive motor measures. On the other hand, the pricing for non-residential HVAC motor measures is representative of a range of horsepowers.
- **First cost only.** The pricing contained in the measure cost data is for first cost only and does not include O&M or life cycle cost data. For example, it is well known that compact fluorescent lamps last 5-10 times longer than an incandescent lamp thus saving on lamp replacement costs. No systematic attempt was made to capture these types of lifecycle cost factors.
- **Scalability of cost units.** Each measure cost is associated with a "cost unit" which means that the cost data has been normalized to some common unit of measure. For example, furnace cost data is normalized to per kBtuh and air conditioning equipment is normalized to per ton. However, there are limits to the amount that a single normalized cost variable can be scaled or extrapolated to compute a price for units with a broad size range. In those instances where an analyst is examining a measure with a wide range of sizes, it is advisable to review the more detailed costs in the supplemental downloadable cost file to see if there is cost data for sizes that are more consistent with those being analyzed.
- **Refrigeration measures costs.** Incremental and installed costs for refrigeration measures can vary depending on the application and cost basis. The values reported in the measure details from the website are for one application and cost basis configuration. Users of the refrigeration cost data are advised to consult the supplemental downloadable cost file for additional variation in refrigeration measure cost information relative to different applications.

As noted above, there are five elements to the cost data presentation: base equipment, measure equipment, incremental cost, labor cost, and installed cost. The incremental and installed costs are computed values that are calculated as described in Exhibit 1.

**Exhibit 1: Calculation of Costs According to Cost Basis**

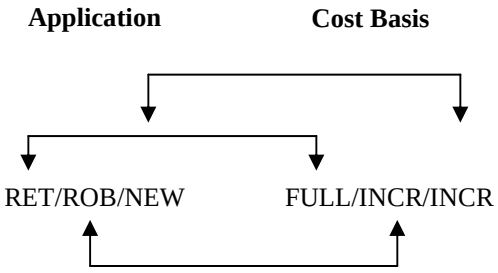
| Cost Basis | Base Equipment Cost | Measure Equipment Cost | Incremental Cost | Labor Cost | Installed Cost |
|---|---|---|---|---|---|
| Incremental (INCR) | a | b | b – a | | |
| Installed (FULL) | | b | | c | b + c |

Most measures have more than one application code and many have all three. In the case of multiple applications, the appropriate cost basis is identified for each measure application designator. Examples of measures with different application and cost basis designations and how the cost data is organized are presented in Exhibit 2.

**Exhibit 2: Examples of Measure Cost Presentation**

| Measure | Application | Cost Basis – Cost Units | Base Equip Cost | Measure Equip Cost | Incremental Cost | Labor Cost | Installed Cost |
|---|---|---|---|---|---|---|---|
| H.E. Packaged AC | RET/ROB/NEW | FULL/INCR/INCR – tons | a | b | b – a | c | b + c |
| LED Exit Signs | RET | FULL – sign | | b | | c | b + c |
| Integral CFLs | RET/ROB/NEW | FULL/INCR/INCR – lamp | a | b | b – a | c | b + c |

It should be noted that the layout of the application and the cost basis designators is linked; the first designator in the application is related to the first designator in the cost basis, the second to the second, and so on. For measures with multiple applications and cost bases, the designators may be interpreted as follows:




## 4. Definitions

Exhibit 3 provides definitions for the codes and terminology used is the measure cost data.

## 5. Cost Units

There are two types of units in use in the database: energy common units and cost units. For example, the energy savings and costs may be normalized by square foot, tons, horsepower, and so on. In many cases the units for energy and the units for cost are the same. For some measures, however, the units differ. For example, for Energy Management Systems the common unit is per building for energy savings estimates, while the cost unit is per control point.

The presentation of the data accounts for this by appending the cost units to the cost basis designators in the measure details, and indicating the cost units as a distinct field in the presentation of the data in the supplemental downloadable file. As a general guide, the cost units are presented as follows in the measure detail from the website:

FULL – Cost Units

INCR/INCR – Cost Units

FULL/INCR/INCR – Cost Units

For example, high efficiency packaged air conditioning equipment is considered to be a RET/ROB/NEW application with a FULL/INCR/INCR cost basis. The cost units are per ton. The cost units will then be presented along with the application and cost basis as shown in Exhibit 2 above.

**Exhibit 3: MCS Study Data Definitions**

| Name | Definition |
|---|---|
| Measure ID Number | The unique measure ID number for each measure. |
| Application | Three application codes are used to identify how the measure is expected to be applied:<br>▪ Retrofit (RET) – replacing a working system prior to failure with a new technology or installing a technology that was not there before<br>▪ Replace-on-burnout (ROB) – replacing a technology at the end of its useful life<br>▪ New construction (NEW) – installing a technology in a new construction or major renovation project |
| Cost Value | Cost values are the estimated incremental or installed cost and are defined as what a program participant would pay to implement the measure. *Note: The costs provided in this report are for first costs only and do not include differences in ongoing operations and maintenance (O&M) costs.* |
| Cost Unit | The cost units of the values shown, e.g., SqFt, Ton, HP, etc. Measure cost units are indicated on the website in the cost basis field and separately identified for each measure in the downloadable supplemental cost data. |
| Cost Basis | Defines whether the cost is:<br>▪ Incremental (INCR) – the differential cost between a base technology and an energy-efficient technology.<br>▪ Installed (FULL) – the full or installed cost of the measure including equipment, labor, overhead & profit |
| Volume | Defines the volume or bulk purchase levels associated with the cost estimate.<br>▪ High – A quantity purchase that may result in a discount on the price<br>▪ Low – A single or lowest volume tier purchase |
| Cost Type | Defines whether the cost is:<br>▪ Wholesale<br>▪ Retail<br>▪ Manufacturer's Suggested Retail Price (MSRP) |
| Measure Equipment Cost | The cost of the energy efficient technology or equipment. |
| Base Equipment Cost | The cost of the less efficient base case technology or equipment. |
| Incremental Cost | The differential cost between the energy efficient and base case or less efficient alternative. |
| Labor Cost | The cost associated with labor to install the technology or measure. |
| Installed Cost | The installed cost of technology or measure including equipment and labor including contractor overhead and profit. The equipment cost component is typically the measure equipment cost. |
| Cost Observation | A single price point for an individual measure or measure configuration. |
| Number of Observations | The number of raw cost observations available for analysis. This count of observations is done at the individual technology or technology configuration level. |
| Sector | Identifies if the sector where the measure is applied is:<br>▪ Res – residential<br>▪ NonRes – non-residential |

| | |
|---|---|
| Delivery Channel | The market distribution channel by which a program participant would access or acquire the measure:<br>▪ Contractor<br>▪ Retail |